

(TRANSLATION)

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Title of invention: Ink-jet recording paper specification

1. TITLE OF THE INVENTION: INK-JET RECORDING PAPER

2. What I claim is:

1. Ink-jet recording paper characterized in that a coat layer containing non-gluey silica particles and a high polymer binder is provided on base paper.
2. The ink-jet recording paper of claim 1 wherein the particle size of non-colloidal silica particles is $0.1 - 10 \mu$.
3. The ink-jet recording paper of claim 1 or 2 wherein the coat layer contains starch.

3. DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to recording paper used for an ink-jet recording system to form characters and images by jetting fine ink liquid-drops.

Since the ink-jet recording system is ordinarily used in offices, water base ink is mostly used in view of hygiene. And, in order to write speedily, ink adhered

onto the paper requires to be absorbed quickly. Especially, in the case of a color ink jet superposition system using a plurality of ink nozzles wherein a plurality of different ink drops collide with the same point, the ink drop that collides beforehand is required to complete its absorption into the surface of paper before the subsequent ink drop arrives, and also because of the large quantity of liquids, recording paper requires a large capacity of absorption.

In the meantime, while in ink jet systems other than an ink mist system, namely, an Onodacondo system, electric field control system and charge control system, an image is formed from picture elements or respective ink dots, and resolution depends on the size of dots and their array, it is desirable that the size of ink liquid drops should be as small as possible since high resolution is required. However, because of the restrictions on the ink jet mechanism or on the required density of images, it is necessary to restrict the spread of adhered ink drops on the paper to attain higher resolution. Also, the mode of the spread is required to expand uniformly starting from the point of collision as a center to form a circular image.

Besides, in order to obtain a highly dense, clear image, a color coupler requires to be retained on the surface of paper. However, since the ink uses a dye to prevent jet nozzles from clogging, it is not easy to have a vehicle such as water, solvent or the like penetrate into the paper with the dye left on the surface of the paper.

In the meantime, presently used as ink-jet recording paper are water-absorbent bond paper, paper for forms slightly applied with size, paper having adjusted bulkiness, permeability and size to balance ink absorption speed with spreading of ink. Though absorption of ink gets faster in these kinds of paper when sizing is

removed, the way of spread of ink drops on the surface of paper is affected by the array of paper fibers, and thus ink spreads radially or in irregular shapes, and spreads wider. As a result, the resolution of the image lowers and uneven density occurs. While porosity in the layer of paper is increased by increasing the bulkiness of the paper without sizing, the absorption of ink gets faster, whereas the spread of ink drops gets slightly smaller to the contrary. However, since ink enters deep in the paper, the density of the image (reflection density) on the surface lowers considerably, resulting in a lusterless, quiet tone of color. In some extreme cases, ink strikes through the back.

In art paper or writing paper applied with size, though ink spreads narrowly and shows a circle shape, the ink stays on the paper for a long time and ink bleeding can be observed conspicuously, and thus it may cause inconvenience as to handling of paper immediately after written and also as to stacking of the paper. Also, it involves a problem such as flowing out of a lot of ink adhered to a high density image portion, and thereby these types of paper are not suitable for practical use, though the color tone of images becomes distinct. While extreme defects can be improved to some extent by making adjustments to size and bulkiness, the speed of ink absorption required by ink-jet is not compatible at all with the quality of images, and thus the required level of the jet-ink system cannot be achieved with each characteristic being lowered.

Based on the above fact, the present invention provides ink-jet recording paper that is suitable for high-speed writing while achieving high resolution and distinct images.

Namely, the present invention is to provide ink-jet recording paper

characterized in that a coat layer containing non-gluey silica particles and a polymer binder on base paper. In this case, it is desirable that the size of non-gluey silica particles is $0.1 - 10 \mu$. Also, the coat layer may contain starch.

Though non-gluey silica particles of $0.1 - 10 \mu$ are suitable, colloidal fine silica particles are not preferable as they prevent ink absorption.

As polymer binders, used are such resins as polyvinyl acetate, polyvinyl alcohol, polyvinyl chloride, vinyl chloride-vinyl acetate copolymers, vinyl acetate-maleic acid copolymers, poly acrylic ester, poly methacrylate ester, styrene-butadiene copolymers and the like.

These resins are suitable for use as fluids or dispersion fluids at the ratio of some $0.2 - 1.5$ parts by weight (solids) for 1 part of said non-gluey silica particles by weight.

Rice starch, corn starch, starch or wheat starch and others can be used as starch, and approximately $0.1 - 5 \mu$ is suitable. While $0.5 - 3$ parts by weight per 1 part of polymer binders by weight are suitable, the use of the starch may be saved depending on the kind of polymer binders and blending quantity.

Coating fluids are made by combining said materials adequately, and by dispersing these material in water using an appropriate dispersion device. Coat layers are finished by applying the coating fluids onto base paper, and thence by hot-air drying. $0.5 - 15 \text{ g/m}^2$ are suitable for coat layers as adherence quantity.

While printing paper that is used for base paper can be selected in accordance with its application, application of appropriate sizing is recommended.

Non-gluey silica in the coat layer having a strong hydrophilic property absorbs water rapidly and retains it in the layer, and thereby the apparent ink drying speed

of recording paper is considerably increased.

Polymer binders not only act as a bonding agent but also prevent ink from spreading longitudinally on the paper, and thus the enlargement of ink dot images is prevented.

Since starch has an adequate hydrophilic property to water, it helps make adjustments to the absorption and spread of ink.

According to the present invention, as a result that said action of respective compound agents can prevent the infiltration of ink, retaining the color coupler (dye and the like) of ink on the coat layer of the surface, ink image density is widely improved and at the same time, the color tone is also made distinct. Along with the restraint on longitudinal spread of ink, blurs are prevented, and thus ink dot images are made regularly arranged, thereby making images look pretty. At the same time, the density of ink dots can be increased and therefore the ink-jet recording system is made available. Furthermore, since ink is absorbed very rapidly in the coat layer mainly consisting of silica, speedy writing is made feasible.

Even in a color process that uses a plurality of kinds of ink, writing in high speed is made possible, since ink absorption as well as apparent drying is fast and absorption capability is large, while color rendering properties, a problem in color processing in particular, can be largely improved since ink does not penetrate deep into the paper layer.

The following description deals with a preferred embodiment.

A preferred embodiment 1:

Water	800 ml
Non-gluey silica (3 - 5 μ)	40 g
Corn starch	100 g

Coating fluids are made by dispersing the above material using a homogenizer, adding 90 g of vinyl acetate emulsion (solid portion 50%), and then mixing fully. The recording paper having an adherence quantity of approx. 4 g/m² on the coat layer is obtained by applying said coating fluids on wood free paper having a scale weight of 60 g/m², and by drying with a hot air dryer.

As a result that water base ink-jet black ink is jetted on said recording paper from an ink-jet nozzle 50 μ in dia. with the test recorded, nearly circular ink dot images, some 125 μ in dia., having a high image density without any blurs are obtained.

Preferred embodiment 2:

Water	1000 ml
Non-gluey silica (3 - 5 μ)	80 g
Corn starch (4 - 5 μ)	200 g

Coating fluids are made by dispersing the above material using a homogenizer, adding 200 g of polyvinyl alcohol (degree of polymerization 500), and then mixing fully. The recording paper having the adherence quantity of approx. 7 g/m² on the coat layer is obtained by applying said coating fluids on the wood free paper having a scale weight of 80 g/m² in the same way as the preferred embodiment 1.

As a result that water based black ink is jetted on said recording paper from an

ink-jet nozzle 40μ in dia. with the test recorded, clear and nearly circular ink dots having a diameter of some 120μ without any blurs are obtained.

The following shows the test results of comparison of the characteristics of the recording paper as obtained in the preferred embodiment 1 and the preferred embodiment 2 with other non-coat paper.

<i>Kind of paper</i>	<i>Ink absorption time (sec.)</i>	<i>Dot dia. (μ)</i>
Embodiment 1	15	125
Embodiment 2	25	120
Wood free paper	70	175
Kent paper	50	175
Art paper	40	250
Machine made Japanese paper	10	370 or more

(Note) Ink absorption time: Amount of time required for ink to settle to the degree that ink cannot be removed by wiping with a finger

Dot diameter: Indicates a longer diameter.

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